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(71) Applicant *(for all designated States except US)*: **ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE** [KR/KR]; 161, Gajeong-dong, Yuseong-gu, Daejon 305-350 (KR).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **LEE, Gwang-Soon** [KR/KR]; #407-302 Yeolmae Maeul Apt., Jijok-dong, Yuseong-gu, Daejon 305-770 (KR). **LEE, Hyun** [KR/KR]; #2-303, Garam Villa, 149-13, Sinseong-dong, Yuseong-gu, Daejon 305-804 (KR). **YANG, Kyu-Tae** [KR/KR]; #108-204 Narae Apt., Jeonmin-dong, Yuseong-gu, Daejon 305-729 (KR). **HAHM, Young-Kwon** [KR/KR]; #133-101 Hanbit Apt., Eoeun-dong, Yuseong-gu, Daejon 305-755 (KR). **LEE, Soo-In** [KR/KR]; #106-606 Clover Apt., Dunsan-dong, Seo-gu, Daejon 302-772 (KR).

(74) Agent: **SHINSUNG PATENT FIRM**; Haecheon Bldg., 741-40, Yeoksam 1-dong, Kangnam-gu, Seoul 135-924 (KR).

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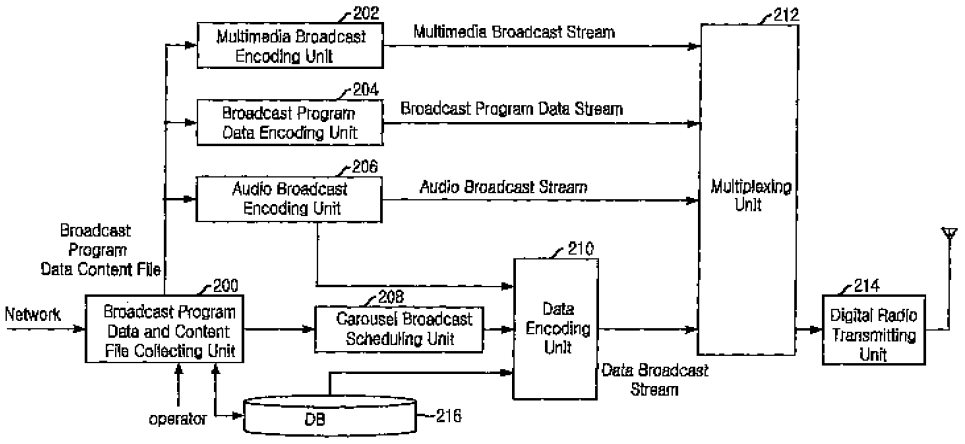
(54) Title: DIGITAL RADIO BROADCAST TRANSMITTING/ RECEIVING SYSTEM FOR PROVIDING DOWNLOAD SERVICE OF DATA FILES RELATED TO BROADCAST CONTENTS AND METHOD THEREFOR



(57) Abstract: Provided are a digital radio broadcast transmitting/receiving system for providing a download service of data files related to broadcast contents, the method thereof, and a computer-readable recording medium for recording a program that implements the method. The system and method provide broadcast contents by, on the transmitting part, making the data files of the broadcast contents have the same title as the broadcast content, segmenting the data files, allocating the segments dynamically, and transmitting them to data broadcast stream; and, on the receiving part, extracting only the segments for the data files having the same title as a content selected by a user, restoring and storing the data files. The broadcast transmitting system includes a broadcast program data and content file collecting unit, a content stream generating unit, a broadcast program data encoding unit, a carousel broadcast scheduling unit, a data encoding unit, a multiplexing unit, and a digital radio transmitting unit.

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Description

DIGITAL RADIO BROADCAST TRANSMITTING/ RECEIVING SYSTEM FOR PROVIDING DOWNLOAD SERVICE OF DATA FILES RELATED TO BROADCAST CONTENTS AND METHOD THEREFOR

Technical Field

[1] The present invention relates to a digital radio broadcast transmitting/receiving system for providing a download service of data files related to broadcast contents in a digital radio broadcast, a method therefor, and a computer-readable recording medium that implements the method. More particularly, the system and method provide a download service of data files related to broadcast contents by, on the transmitting part, making the data files (which are data files for a current broadcast content and data files for several broadcast contents broadcasted previously) of the broadcast contents, which are the subjects of the download service, have the same title as the broadcast content, segmenting the data files, allocating the segments dynamically so that as a data file whose broadcasting time is closer to the current time, the number of transmission repetition is larger, and transmitting them to data broadcast stream; and, on the receiving part, extracting only the segments for the data files having the same title as a content selected by a user, restoring and storing the data files.

Background Art

[2] Fig. 1 is a block diagram showing an audio file download service in a conventional digital radio broadcasting system.

[3] The conventional digital radio broadcasting system includes a radio station 10, a digital radio receiver 12, and a music selling server 14.

[4] The radio station 10 adds music data and sale data to a particular section of a radio broadcast signal and transmits the radio broadcast signal having music data and sale data therein.

[5] The digital radio receiver 12 processes the radio broadcast signal transmitted from the radio station 10 into an audio signal and outputs the audio signal. Also, it displays the music data and sale data which are included in the particular section of the radio broadcast signal, sends a purchase request for a particular music file to the music selling server 14 from a remote place through a communication network. The digital radio receiver 12 includes such a device as a Personal Digital Assistant (PDA).

[6] The music selling server 14 sells the music file requested to be purchased by the digital radio receiver 12, such as PDA, through the communication network. In other words, the music selling server 14 is connected to the communication network such as the Internet, and a music file having a format such as Moving Picture Experts Group (MPEG) Audio Layer-3 (MP3) is sold and transmitted to the PDA.

[7] However, despite the drastic rise in the number of music selling servers that sell high-quality music files at low prices, there is a problem that the music files can be sold only by some music sellers designated by a radio station. This is because sales data for access to a music selling server should be added to a radio broadcast signal to be transmitted along the radio broadcast signal and the access between the digital radio receiver 12 and the music selling server 14 should be achieved based on the broadcast signal.

[8] In addition, if one communication company is designated as a business company the personal mobile terminals can access to due to restriction in communication technology, a wireless communication network should be used because the personal mobile terminal cannot directly access to the selling company designated by the broadcasting station but use the wireless communication network. This causes a problem that it costs expensive service charge to download files.

[9] In case of a digital television (TV) data broadcast that provides data for free or provide to a plurality of clients by using a low-price broadcasting channel, entity data related to entities, e.g., characters, accessories and storyline, are displayed on a screen of a TV broadcast program through a predetermined transmission media, such as a celestial broadcasting network or a satellite network, a terrestrial network, a cable network and a wired network, and the Internet. Also, diverse data related to the broadcast contents as well as additional service data, e.g., the address of the data broadcast contents of the entities, e-commerce and network shopping, are provided to the receiving terminal along with the TV broadcast program.

[10] The receiving part can watch the data related to the broadcast contents while watching the data broadcast program with a terminal capable of receiving the data broadcast, such as a digital TV set or a computer. Since the commercial data broadcast uses a digital TV (DTV), cable TV and the like as its transmission media, the data channel capacity for data transmission can be secured relatively sufficiently.

[11] However, in case of digital radio broadcast, its transmission channel capacity is smaller than that of the digital TV data broadcast. So, there is a limit to the number and volume of data that can be transmitted, and the receiving part needs a method for

scheduling data broadcasts and encoding data efficiently in order to download a desired data file with least delay time.

[12] The file download service of a conventional mobile communication terminal that perform one-to-one communication based on the characteristics of mobile communication network has a problem that the cost for transmitting and receiving broadcast contents is expensive because an individual has to occupy a predetermined band of mobile communication.

[13] In general digital radio broadcast, music in the middle of broadcasting may be known to a listener or may not be known until the broadcaster tells about the music. If a listener likes the music and wants to download it, he/she should keep the music in mind and ask someone else around him/her later or search the Internet, which is quite inconvenient.

Disclosure of Invention

Technical Solution

[14] It is, therefore, an object of the present invention to provide a digital radio broadcast transmitting system for providing a download service of data files related to broadcast contents so that a receiving part could download the data files related to a desired broadcast content at a low price without accessing to an additional content selling server, a method therefor, and a computer-readable recording medium that implements the method. The system and method provide a download service of data files related to broadcast contents by making the data files of the broadcast content (i.e., a currently broadcasted content and several broadcast contents broadcasted before the current broadcast content) have the same title as the broadcast content, segmenting the data files segments, allocating the segments dynamically so that the number of transmission repetition becomes larger, as the broadcasting time of a data file is closer to the current time, and transmitting the segments to data broadcast stream. The data files of the broadcast contents are the subjects of the download service is the subject of the download service in the digital radio broadcast.

[15] It is another object of the present invention to provide a digital radio broadcast receiving system for downloading data files related to broadcast contents with least delay time on a receiving part by extracting segments related to data files having the same title as a content selected by a user on the receiving part and restoring and storing the data files, a method therefor, and a computer-readable recording medium for recording a program that implements the method.

[16] In accordance with one aspect of the present invention, there is provided a digital

radio broadcast transmitting system for providing a download service of data files related to broadcast contents, including: a broadcast program data and content file collecting unit for collecting broadcast program data and data files related to broadcast contents, the data files being the subjects of the download service; a content stream generating unit for generating broadcast content stream by encoding the collected data files related to broadcast contents; a broadcast program data encoding unit for generating a list of data files, which will be referred to as a data file list, by utilizing the broadcast program data, and generating broadcast program data stream by adding the data file list to the broadcast program data and performing encoding; a carousel broadcast scheduling unit for generating a carousel allocation model by using the broadcast program data and the data files related to broadcast contents both of which are collected by the broadcast program data and content file collecting unit; a data encoding unit for generating data broadcast stream by segmenting the data files related to the broadcast contents, which include a currently broadcasted content and a pre-determined number of broadcast contents already broadcasted to thereby obtain segments, and dynamically allocating the segments based on the carousel allocation model; a multiplexing unit for multiplexing the broadcast content stream, the broadcast program data stream, and the data broadcast stream to thereby obtain multiplexed broadcast stream; and a digital radio transmitting unit for transmitting the multiplexed broadcast stream to a digital radio broadcasting network.

[17] In accordance with another aspect of the present invention, there is provided a digital radio broadcast receiving system for downloading data files related to broadcast contents, including: a digital radio receiving unit for inverse-multiplexing a digital radio broadcast signal into broadcast stream, broadcast program data, and data broadcast stream; a broadcast processing unit for decoding the inverse-multiplexed broadcast stream; a user accessing unit for receiving selection data for a data file a user wants to download from the user; a data file processing unit for transmitting to an outputting unit a list of data files that is extracted from broadcast program data outputted from the digital radio receiving unit, extracting only the segments related to a data file having the same title as a broadcast content selected by a user from the data broadcast stream based on the selection data inputted by the user, and restoring and storing the data file, the list of data files being referred to as a data file list; and the outputting unit for outputting decoded video/audio signals transmitted from the broadcast processing unit, or outputting the data file list transmitted form the data file processing unit in the form of video/audio.

[18] In accordance with another aspect of the present invention, there is provided digital radio broadcast transmitting method for providing a download service of data files related to broadcast contents, including the steps of: a) collecting broadcast program data and data files related to broadcast contents, the data files being the subjects of the download service; b) generating broadcast content stream by encoding the collected data files related to the broadcast contents; c) generating a list of data files, which will be referred to as a data file list, by utilizing the broadcast program data and generating broadcast program data stream by adding the data file list to the broadcast program data and performing encoding; d) generating a carousel allocation model by using the broadcast program data and the data files related to the broadcast contents; e) generating data broadcast stream by segmenting the data files related to the broadcast contents, which include a currently broadcasted content and a predetermined number of broadcast contents already broadcasted and dynamically allocating the segments based on the carousel allocation model; and f) multiplexing the broadcast content stream, the broadcast program data stream, and the data broadcast stream and transmitting the multiplexed broadcast content stream, the multiplexed broadcast program data stream, and the multiplexed data broadcast stream to a digital radio broadcasting network.

[19] In accordance with another aspect of the present invention, there is provided a digital radio broadcast receiving method for downloading data files related to broadcast contents that are applied to a digital radio broadcast, including the steps of: a) inverse-multiplexing a digital radio broadcast signal into broadcast stream, broadcast program data, and data broadcast stream; b) decoding the inverse-multiplexed broadcast stream; c) receiving selection data for a data file a user wants to download from the user; d) generating a list of data files that is extracted from the inverse-multiplexed broadcast program data; and e) restoring the data file by extracting only the segments related to the data files having the same title as the broadcast content selected by the user from the data broadcast stream according to the selection data from the user, storing the restored data file.

Description of Drawings

[20] The above and other objects and features of the present invention will become apparent from the following description of the preferred embodiments given in conjunction with the accompanying drawings, in which:

[21] Fig. 1 is a block diagram showing an audio file download service in a conventional digital radio broadcasting system;

[22] Fig. 2 is a block diagram describing a digital radio broadcast transceiving system for providing a download service of data files related to broadcast contents in accordance with an embodiment of the present invention;

[23] Fig. 3 is a diagram illustrating an encoding method of a data encoding unit of Fig. 2 in accordance with an embodiment of the present invention;

[24] Fig. 4 is a block diagram showing a data encoding unit of Fig. 2 in accordance with an embodiment of the present invention;

[25] Fig. 5 is a flowchart describing a digital radio broadcast transmitting method for providing a download service of data files related to broadcast contents in accordance with an embodiment of the present invention;

[26] Fig. 6 is a block diagram describing a digital radio broadcast receiving method for providing a download service of data files related to broadcast contents in accordance with an embodiment of the present invention;

[27] Fig. 7 is a block diagram illustrating a data processing unit of Fig. 6 in accordance with an embodiment of the present invention; and

[28] Fig. 8 is a flowchart depicting a method for downloading data files related to broadcast contents in a digital radio broadcast receiving system in accordance with an embodiment of the present invention.

Best Mode

[29] Other objects and aspects of the invention will become apparent from the following description of the embodiments with reference to the accompanying drawings, which is set forth hereinafter.

[30] Fig. 2 is a block diagram describing a digital radio broadcast transceiving system for providing a download service of data files related to broadcast contents in accordance with an embodiment of the present invention.

[31] The digital radio broadcast transceiving system includes a broadcast program data and content file collecting unit 200, a multimedia broadcast encoding unit 202, a broadcast program data encoding unit 204, an audio broadcast encoding unit 206, a carousel broadcast scheduling unit 208, a data encoding unit 210, a multiplexing unit 212, a digital radio transmitting unit 214, and a database (DB) 216.

[32] The broadcast program data and content file collecting unit 200 collects 'broadcast program data' and 'data file related to broadcast contents,' or content file, from outside or an operator through a network. The broadcast program data include broadcasting schedule, broadcasting time, and titles of broadcast programs. The broadcast contents include multimedia broadcast contents and audio broadcast contents.

[33] The multimedia broadcast encoding unit 202 and the audio broadcast encoding unit 206 form a content stream generating unit. The content stream generating unit generates broadcast content stream, i.e., multimedia broadcast content stream and audio broadcast content stream, by encoding the data files related to the broadcast contents collected in the broadcast program data and content file collecting unit 200.

[34] The multimedia broadcast encoding unit 202 encodes video for mobile TV broadcast and audio signals related to the video in conformity to broadcasting standards. In other words, it generates multimedia broadcast stream by encoding data files related to the multimedia broadcast contents collected in the broadcast program data and content file collecting unit 200.

[35] The audio broadcast encoding unit 206 encodes audio signals to provide a sound quality as excellent as compact disk (CD) to viewers through the digital radio broadcast. That is, it generates audio broadcast stream by encoding the data files related to the audio broadcast contents collected in the broadcast program data and content file collecting unit 200. Also, the audio broadcast encoding unit 206 adds the title of the currently broadcasted audio content to the audio streams and performs encoding. Addition of the title to the audio stream is applied to a dynamic level service that displays the title of music, i.e., title of the audio content, by using display in the digital radio broadcast. In the present invention, however, it is used to search audio related files among the data files on the receiving part.

[36] The broadcast program data encoding unit 204 generates a list of data files to be provided to a user through a screen of the receiving part by using the broadcast program data transmitted from the broadcast program data and content file collecting unit 200. Then, it generates broadcast program data stream by adding the data file list to the broadcast program data transmitted from the broadcast program data and content file collecting unit 200 and carrying out encoding. The data file list means a list of data files related to the currently broadcasted content and some contents broadcasted before the current broadcast content.

[37] The carousel broadcast scheduling unit 208 generates a carousel allocation model by using data files related to the broadcast program data and broadcast contents which are transmitted from the broadcast program data and content file collecting unit 200. The carousel allocation model is formed by making the number of segment transmission and repetition larger, as a data file has a broadcasting time that is closer to the current time point.

[38] The data encoding unit 210 segments the data files related to the currently

broadcasted audio broadcast content (see A of Fig. 3) and some audio broadcast contents (see B and C of Fig. 3) broadcasted right before the current audio broadcast content according to the carousel allocation model generated by the carousel broadcast scheduler 208 to thereby obtain segments, and generates data broadcast stream by allocating the segments dynamically, which is shown in Figs. 3 and 4. During the process, the data encoding unit 210 makes the data files related to the current content and the contents already broadcasted have the same title as the broadcast content by using the titles of audio contents that are currently broadcasted or already broadcasted.

[39] The data files transmitted as the subjects of the download service may be diverse multimedia data that are provided by existing data broadcast, but they are defined as audio-related multimedia files broadcasted as current audio broadcast, such as audio, video, game, advertisement (AD), local data and the like.

[40] The database (DB) 216 stores data files related to broadcast contents and broadcast program data that are collected by the broadcast program data and content file collecting unit 200.

[41] The multiplexing unit 212 multiplexes all broadcast-related streams such as multimedia broadcast stream, broadcast program data stream, audio broadcast stream and data broadcast stream. Then, the multiplexed broadcast stream is transmitted by the digital radio transmitting unit 214 to the digital radio broadcasting network.

[42] Fig. 3 is a diagram illustrating an encoding method of a data encoding unit of Fig. 2 in accordance with an embodiment of the present invention. Generally, in case of the data broadcast in which data are transmitted repeatedly in the form of carousel, if there are many kinds of data to be transmitted, it takes a considerable time for the receiving part to receive the data due to the limit to the channel capacity. Required, therefore, is an efficient method for scheduling transmission time and encoding data that can make the receiving part receive broadcasted data with least delay time.

[43] According to the data encoding for carousel broadcast which is suggested in the present invention, content files A, B and C related to the current content are segmented into segments of a regular size based on a carousel allocation model produced by the carousel broadcast scheduler 208 and then transmitted repeatedly (see 320 of Fig. 3). The list of the broadcasted data files is updated whenever a broadcast content is changed, and transmitted after included in broadcast program data.

[44] The data encoding unit 210 makes the data files 302 of the broadcast contents have the same title 300 as the broadcast content, for example, title of audio and title of advertisement so that the receiving part could easily search the data files selected by the

user.

[45] In order to download audio files such as MP3 quickly, the title 302 of the transmitted data files should be the same as the title 300 of a broadcast content for a dynamic level, for example, titles of audio and advertisement. Then, the data files are encoded and transmitted. Subsequently, the user can download desired data files by searching data files having the same title as the audio content.

[46] As shown in the drawing, data files segmented and transmitted repeatedly are updated to be the data files of the current contents (A) and the data files (B and C) corresponding to several contents broadcasted previously. The numbers of transmission and repetition are large, as a data file is closer to the current time point (see 320 of Fig. 3). By doing so, a data file desired by the receiving part can be downloaded at an arbitrary moment with least delay in an environment with limited data channel capacity.

[47] The number of repeated files and the number of data files that the user on the receiving part can select to download can be determined in consideration of the channel capacity and the length of a file. The minimum case is that only the data files corresponding to the currently broadcasted content can be downloaded. The data files related to the current content can be MP3 related to audio contents, video such as music video, games, advertisements and local data.

[48] Fig. 4 is a block diagram showing a data encoding unit of Fig. 2 in accordance with an embodiment of the present invention. The data encoding unit 210 includes a carousel dynamic allocation control unit 400, a file distributing unit 402, a dynamic allocating unit 404, and a First-In First-Out (FIFO) buffer 406. The dynamic allocating unit 404 includes a plurality of dynamic allocators 408, 416 and 424, and each dynamic allocator 408, 416 or 424 includes carousel banks 410, 418 and 426, clock generators 412, 420 and 428, and switches 414, 422 and 430.

[49] The carousel broadcast scheduling unit 208 generates a carousel allocation model by using broadcast program data and data files related to contents that are transmitted from the broadcast program data and content file collecting unit 200.

[50] The carousel dynamic allocation control unit 400 controls the file distributing unit 402 and the clock generators 412, 420 and 428 based on the carousel allocation model provided by the carousel broadcast scheduling unit 208. The carousel allocation model is a kind of a mathematical model for distributing the data files corresponding to the contents already broadcasted based on an arbitrary broadcasting time point. It is calculated by diverse parameters on the transmitting and receiving parts.

[51] The data encoding method of the present invention that utilizes the file distributing unit 402 and the clock generators 412, 420 and 428 will be described further, hereafter.

[52] The file distributing unit 402 makes the data files of the current broadcast contents and some contents already broadcasted before the current broadcast content have the same title as the corresponding content. The data files are the subjects of the downloaded service. It also segments each of the data files for carousel broadcast according to the control of the carousel dynamic allocation control unit 400 to thereby obtain segments and stores the segments in a corresponding carousel bank 410, 418 or 426 according to each data file. Also, the file distributing unit 402 transmits data files corresponding to a newly broadcasted content to a carousel bank which has performed the largest number of transmission at a time point when the broadcast content is changed.

[53] The carousel banks 410, 418 and 426 stores the segments of the data files distributed by the file distributing unit 402 according to each data file. That is, it stores the segments related to a data file 'A' in an A file carousel bank and the segments related to a data file 'B' in a B file carousel bank.

[54] The clock generators 412, 420 and 428 generate clocks periodically according to the control of the carousel dynamic allocation control unit 400. The clock period is shorter as the broadcast time of a content of a carousel bank is closer to the current time point.

[55] The switches 414, 422, 430 perform rotary switching according to a clock generated by each clock generator 412, 420 or 428, and accumulate the segments of the data files stored in the carousel banks 410, 418 and 426 in the FIFO buffer 406. In the present invention, the number of segments of each bank accumulated in the FIFO buffer 406 finally becomes irregular by making the clock period different according to the carousel bank for each file.

[56] Eventually, the number of segments of each data file accumulated in the FIFO buffer 406 for carousel data broadcasting is determined in accordance with the control of the carousel dynamic allocation control unit 400 based on a carousel allocation model. The segments of a data file related to a recently broadcasted content are b roadcasted frequently by making the clock rate quicker as the carousel bank is distributed more recently based on the current time point.

[57] The data encoding process can be implemented in various methods such as software and hardware.

[58] Fig. 5 is a flowchart describing a digital radio broadcast transmitting method for

providing a download service of data files related to broadcast contents in accordance with an embodiment of the present invention.

[59] First, at step S500, the broadcast program data and content file collecting unit 200 collects broadcast program data and content files related to broadcast contents such as multimedia broadcast contents and audio broadcast contents and stores them in the database 216.

[60] At step S502, the content stream generating unit which is formed of the multimedia broadcast encoding unit 202 and the audio broadcast encoding unit 206 encodes the data files related to collected broadcast contents and generates broadcast content stream, i.e., multimedia broadcast content stream or audio broadcast content stream. The audio broadcast encoding unit 206, one of the elements that forms the content stream generating unit, performs a function of adding the title of a currently broadcasted audio content to the audio broadcast stream during the audio broadcast encoding process.

[61] Meanwhile, at step S504, the broadcast program data encoding unit 204 generates a list of data files by utilizing collected broadcast program data. At step S506, broadcast program data stream is generated by including the data file list in the broadcast program data.

[62] At step S508, the carousel broadcast scheduling unit 208 generates a carousel allocation model by utilizing the collected broadcast program data and data files related to broadcast contents. The carousel allocation model is formed in such a way that more segments are allocated to a data file as the data file is related to a broadcast content whose broadcasting time is closer to the current time point in order to increase the number of transmission repetition of the data file.

[63] Subsequently, at step S510, the data encoding unit 210 segments the data files related to the currently broadcasted audio broadcast content and the data files related to several broadcast contents broadcasted before the current broadcast content based on the generated carousel allocation model. At step S512, it generates data broadcast stream by performing carousel dynamic allocation of segments according to the carousel allocation model. During the data encoding process, the data files related to the current broadcast content and some contents already broadcasted are made to have the same title as the broadcast contents before the segmentation.

[64] At step S514, the multiplexing unit 212 multiplexes the broadcast content stream, broadcast program data stream and data broadcast stream generated in the steps S502, S504 and S512. At step S516, the digital radio transmitting unit 214 transmits the

multiplexed broadcast stream to a digital radio broadcast network.

[65] Fig. 6 is a block diagram describing a digital radio broadcast receiving system for downloading data files related to broadcast contents in accordance with an embodime nt of the present invention.

[66] The digital radio broadcast receiving system includes a digital radio receiving unit 600, a multimedia broadcast processing unit 602, an audio broadcast processing unit 604, a data processing unit 606, a user accessing unit 608, a return channel accessing unit 610, and an output unit 612.

[67] Hereafter, the structure of the digital radio receiving system will be described in detail. The digital radio receiving unit 600 receives a radio frequency (RF) signal and decodes it into digital radio broadcast stream. The digital radio receiving unit 600 is equipped with functions of basic RF reception, RF-to-IF conversion, inverse multiplexing. It receives a digital radio broadcast signal and inverse-multiplexes it into broadcast stream, broadcast program data, and data broadcast stream.

[68] The multimedia broadcast processing unit 602 decodes video and audio stream for mobile TV broadcast into video audio signals that can be shown through the output unit 612 such as a display and a speaker.

[69] The audio broadcast processing unit 604 processes digital audio broadcast. It decodes audio-only stream that can provide audio quality as excellent as a CD into audio-only signals, transmits the decoded signal to the output unit 612, i.e., a speaker, decodes data corresponding to the title of an audio content carried on the audio-only stream, and transmits the decoded data to the data processing unit 606. The audio content title data denote title data of an audio content currently broadcasted.

[70] The data processing unit 606 decodes and plays data files. It receives broadcast program data stream and data broadcast stream from the digital radio receiving unit 600 and outputs the data file list included in the received broadcast program data stream to the user through the output unit 612. Subsequently, if the user selects a data file to be downloaded in the data file list, the data processing unit 606 downloads the selected data file. This method is called 'selective download'.

[71] Meanwhile, if there is a request from the user for download of a data file related to the currently broadcasted content (in other words, if a selection data for download is transmitted from the user), the data processing unit 606 can search and store data files having the same title as an audio content transmitted from the audio broadcast processing unit 604 by using the title data of the audio content. According to this function, the data file related to the current broadcast content is stored by simply

pressing a function button without any selection from the data file list. Especially, this function is convenient when it is difficult to select a data file from the data file list, for example, when the user wants to download some data files during driving. This method is called 'simple download.'

[72] Also, after the download of a data file desired by the user, if there is a request from the user, the data processing unit 606 can play the downloaded data file so that the user can watch it or transmit the data file to a personal computer (PC) in the outside through an interface device.

[73] The user accessing unit 608 for user access receives data on the data file selected for download from the user and transmits the selection data to the data processing unit 606.

[74] The return channel accessing unit 610 receives and transmits user authentication data and charge data for a pay service by using an additional communication line such as a mobile communication network.

[75] The output unit 612 outputs decoded audio and video signals related to the broadcast contents, which are transmitted from the multimedia broadcast processing unit 602, the audio broadcast processing unit 604 and the data processing unit 606, in the form of video or audio. It also outputs the video and audio signals related to the data file list transmitted from the data processing unit 606.

[76] Fig. 7 is a block diagram illustrating a data processing unit of Fig. 6 in accordance with an embodiment of the present invention. The data processing unit 606 includes a broadcast program data interpretation and content file search unit 700, a data decoding unit 702, a storage 704, an audio/video processor 706 and an external interface unit 708.

[77] The broadcast program data interpretation and content file search unit 700 interprets broadcast program data transmitted from the digital radio receiving unit 600, extracts a data file list from the broadcast program data, and outputs the data file list through the output unit 612. Then, if the user selects a particular data file among the data files in the list (i.e., if the download method is 'selective download'), the broadcast program data interpretation and content file search unit 700 searches the title data of the data files received from the data decoding unit 702 to find out the same title as the data file selected by the user, and transmits ID data for a searched file to the data decoding unit 702.

[78] Meanwhile, in case of 'simple download,' broadcast program data interpretation and content file search unit 700 searches for a data file having the same title as the

currently broadcasted audio content, which is transmitted from the audio broadcast processing unit 604, among the title data of the data files transmitted from the data decoding unit 702, and then transmits ID data for a searched data file to the data decoding unit 702.

[79] The data decoding unit 702 analyzes data broadcast stream transmitted through a data channel and receives ID data and title data for transmitted data files. Then, it transmits the title data and ID data related to the data files to the broadcast program data interpretation and content file search unit 700 (see 711). Subsequently, if the data decoding unit 702 receives ID data for the data file selected by the user from the broadcast program data interpretation and content file search unit 700 (see 712), it extracts only the segments of the data file selected by the user by using the ID data and restores the data file by combining the segments and stores the restored data file in the storage 704.

[80] Also, the data decoding unit 702 can perform data decoding conditionally to generate charge data by using a charging device, such as user authorization by a return channel or a smart card.

[81] The audio files or video files related to the audio files that are stored in the storage 704 can be played by the audio/video processor 706 at any time when the user request to and they can be transmitted to an external system such as PC by utilizing the external interface unit 708. Through the interface, data files can be transmitted from the digital radio broadcast receiving unit (see Fig. 6) to an external system, such as a PC and a terminal. For example, diverse means such as a serial port, parallel port, Universal Serial Bus (USB) and '1394' can be used as the external interface unit 708.

[82] Fig. 8 is a flowchart depicting a method for downloading data files related to broadcast contents in a digital radio broadcast receiving system in accordance with an embodiment of the present invention. The drawing shows a process of downloading the data files related to a content in the digital radio broadcast receiving unit (see Fig. 6).

[83] At step S800, the digital radio receiving unit 600 inverse-multiplexes a digital radio signal into multimedia broadcast stream, audio broadcast stream, broadcast program data stream, and data broadcast stream. Among the streams, at step S802, the broadcast stream (i.e., multimedia broadcast stream and audio broadcast stream) are processed in the multimedia broadcast processing unit 602 and the audio broadcast processing unit 604 and played through the output unit 612.

[84] At step S804, the data processing unit 606 analyzes the broadcast program data

stream which is transmitted from the digital radio receiving unit 600 and outputs a list of data files related to the currently broadcasted content in the form of video/audio to the user through the output unit 612.

[85] At step S806, the data processing unit 606 checks if the user selected a data file. If there is no selection from the user, the logic goes back to the step S802.

[86] If the download service is a pay service and there is a data file selected by the user, a step S808 for checking user information to charge the user for the download service can be added. The user authentication process in the data processing unit 606 is performed by using user authorization data transmitted from the return channel accessing unit 610.

[87] If the user is authorized, at step S810, the data processing unit 606 recognizes the title data and ID data related to the data files transmitted from the digital radio broadcast transmitting system by analyzing inverse-multiplexed data broadcast stream which is transmitted from the digital radio receiving unit 600. At step S812, the data processing unit 606 retrieves data files having the same title as the data file selected by the user and checks the ID data of the retrieved data file.

[88] If the user's method of selecting a data file is 'selective download' where a certain data file is selected among the data files in the data file list, the data processing unit 606 searches the title data of the data files, which are received at the step S810, for a data file having the same title as the data file selected by the user and checks the ID data of the found data files.

[89] Meanwhile, if the data file selecting method is 'simple download,' the data processing unit 606 searches the data files received at the step S810 for data files having the same title as the current broadcast audio content which is transmitted from the audio broadcast processing unit 604, and checks the ID data of the found data files.

[90] At step S814, the data processing unit 606 extracts only the segments related to the data file selected by the user by using the ID data, restoring a data file by combining the segments, and stores the data file.

[91] The method of the present invention can be embodied as a program and stored in a computer-readable recording medium, such as CD-ROM, RAM, ROM, floppy disks, hard disks and magneto-optical disks.

[92] The technology of the present invention can transmit a data file, which is a subject of the download service, through a data broadcast channel in a digital radio broadcasting network, instead of using an expensive mobile communication network. Therefore, it can make the user download a data file at an inexpensive price.

[93] The technology of the present invention can also minimize the time for downloading a data file in a digital radio broadcasting network having a low-capacity transmission channel by segmenting a plurality of data files, performing carousel dynamic allocation on the segments in such a method that the data file for a broadcast content whose broadcasting time is closer to the current time point could have a larger number of repetition and transmission, and transmitting the data file.

[94] In addition, according to the technology of the present invention, the user can download a desired data file easily and quickly while watching a broadcast content, even without an access to an additional content selling server.

[95] While the present invention has been described with respect to certain preferred embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

Claims

[1] A digital radio broadcast transmitting system for providing a download service of data files related to broadcast contents, comprising:
a broadcast program data and content file collecting means for collecting broadcast program data and data files related to broadcast contents, the data files being the subjects of the download service;
a content stream generating means for generating broadcast content stream by encoding the collected data files related to broadcast contents;
a broadcast program data encoding means for generating a list of data files, which will be referred to as a data file list, by utilizing the broadcast program data, and generating broadcast program data stream by adding the data file list to the broadcast program data and performing encoding;
a carousel broadcast scheduling means for generating a carousel allocation model by using the broadcast program data and the data files related to broadcast contents both of which are collected by the broadcast program data and content file collecting means;
a data encoding means for generating data broadcast stream by segmenting the data files related to the broadcast contents, which include a currently broadcasted content and a predetermined number of broadcast contents already broadcasted to thereby obtain segments, and dynamically allocating the segments based on the carousel allocation model;
a multiplexing means for multiplexing the broadcast content stream, the broadcast program data stream, and the data broadcast stream to thereby generate multiplexed broadcast stream; and
a digital radio transmitting means for transmitting the multiplexed broadcast stream to a digital radio broadcasting network.

[2] The digital radio broadcast transmitting system as recited in claim 1, wherein the content stream generating means includes:
a multimedia broadcast encoding means for generating multimedia broadcast stream by encoding the data files related to the broadcast contents which are collected by the broadcast program data and content file collecting means; and
an audio broadcast encoding means for generating audio broadcast stream by encoding the data files related to audio broadcast contents which are collected by the broadcast program data and content file collecting means.

[3] The digital radio broadcast transmitting system as recited in claim 2, wherein the audio broadcast encoding means further performs a function of adding the title of a currently broadcasted audio content to the audio broadcast stream.

[4] The digital radio broadcast transmitting system as recited in claim 1, wherein the carousel allocation model generated in the carousel broadcast scheduling means is formed in such a method that more segments are allocated as the data file is related to a broadcast content having a broadcasting time closer to the current time point.

[5] The digital radio broadcast transmitting system as recited in claim 1, wherein the data encoding means includes:

a carousel dynamic allocation controlling means for controlling a file distributing means and a carousel dynamic allocating means based on the carousel allocation model generated by the carousel broadcast scheduling means;

the file distributing means for making the data files related to the current broadcast content and the broadcast contents already broadcasted have the same title as the broadcast content, segmenting the data files into segments according to a control signal of the carousel dynamic allocation controlling means, and transmitting the segments to a carousel dynamic allocating means;

the carousel dynamic allocating means for dynamically allocating the segments distributed by the file distributing means according to a control signal of the carousel dynamic allocation controlling means; and

a first-in first-out (FIFO) storing means for storing the segments of the data files allocated by the carousel dynamic allocating means.

[6] The digital radio broadcast transmitting system as recited in claim 5, wherein the carousel dynamic allocating means includes:

a plurality of carousel banks for storing the segments of the data files distributed by the file distributing means by each broadcast content;

a plurality of clock generating means for generating clocks periodically according to a control signal of the carousel dynamic allocation controlling means; and

a plurality of switching means for storing the segments stored in the carousel banks in the FIFO storing means by performing rotary switching according to a clock generated by the clock generating means.

[7] The digital radio broadcast transmitting system as recited in claim 5, wherein a clock period of the clock generating means is short as a carousel bank is related

to a broadcast content having a broadcasting time closer to the current time point.

[8] A digital radio broadcast receiving system for downloading data files related to broadcast contents, comprising:
a digital radio receiving means for inverse-multiplexing a digital radio broadcast signal into broadcast stream, broadcast program data, and data broadcast stream;
a broadcast processing means for decoding the inverse-multiplexed broadcast stream;
a user accessing means for receiving selection data for a data file a user wants to download from the user;
a data file processing means for transmitting to an outputting means a list of data files that is extracted from broadcast program data outputted from the digital radio receiving means, extracting only the segments related to a data file having the same title as a broadcast content selected by a user from the data broadcast stream based on the selection data inputted by the user, and restoring and storing the data file, the list of data files being referred to as a data file list; and
the outputting means for outputting decoded video/audio signals transmitted from the broadcast processing means, or outputting the data file list transmitted form the data file processing means in the form of video/audio.

[9] The digital radio broadcast receiving system as recited in claim 8, wherein the data file processing means includes:
a broadcast program data interpretation and content file searching means for extracting a data file list from the broadcast program data which are transmitted from the digital radio receiving means, transmitting the data file list to the outputting means and, if selection data for a data file to be downloaded are received from the user, searching the data files having the same title as the data file transmitted from a data decoding means, and transmitting identifier (ID) data for the searched data files to the data decoding means;
the data decoding means for recognizing title data and ID data for the data files by analyzing the data broadcast stream which is transmitted from the digital radio receiving means, transmitting the title data and the ID data to the broadcast program data interpretation and content file searching means, extracting only the segments related to the data file selected by the user by using the ID data transmitted from the broadcast program data interpretation and content file searching means, and combining the segments to restore the data file; and

a storing means for storing the data file restored by the data decoding means.

[10] The digital radio broadcast receiving system as recited in claim 9, further including:
an audio/video processing means for playing the data file stored in the storing means upon the user's request.

[11] The digital radio broadcast receiving system as recited in claim 9, further including:
an external interfacing means for transmitting the data file stored in the storing means to the outside upon the user's request.

[12] The digital radio broadcast receiving system as recited in claim 8, wherein the selection data are the title of the data file selected by the user among the data files in the data file list, if the download method is selective download; or if the download method is simple download, the selection data are the title of a currently broadcasted audio content which is transmitted from the broadcast processing means.

[13] A digital radio broadcast transmitting method for providing a download service of data files related to broadcast contents, comprising the steps of:
a) collecting broadcast program data and data files related to broadcast contents, the data files being the subjects of the download service;
b) generating broadcast content stream by encoding the collected data files related to the broadcast contents;
c) generating a list of data files, which will be referred to as a data file list, by utilizing the broadcast program data and generating broadcast program data stream by adding the data file list to the broadcast program data and performing encoding;
d) generating a carousel allocation model by using the broadcast program data and the data files related to the broadcast contents;
e) generating data broadcast stream by segmenting the data files related to the broadcast contents, which include a currently broadcasted content and a pre-determined number of broadcast contents already broadcasted and dynamically allocating the segments based on the carousel allocation model; and
f) multiplexing the broadcast content stream, the broadcast program data stream, and the data broadcast stream and transmitting the multiplexed broadcast content stream, the multiplexed broadcast program data stream, and the multiplexed data broadcast stream to a digital radio broadcasting network.

[14] The digital radio broadcast transmitting method as recited in claim 13, wherein the step b) includes the steps of:
b1) generating multimedia broadcast stream by encoding the data files related to the broadcast contents; and
b2) generating audio broadcast stream by encoding the collected data files related to an audio broadcast content.

[15] The digital radio broadcast transmitting method as recited in claim 14, wherein the title of the currently broadcasted audio content is added to the audio broadcast stream in the audio broadcast encoding process of the step b2).

[16] The digital radio broadcast transmitting method as recited in claim 13, wherein the carousel allocation model generated in the step d) is formed in such a method that more segments are allocated, as the data file is related to a broadcast content having a broadcasting time closer to the current time point.

[17] The digital radio broadcast transmitting method as recited in claim 13, wherein the step e) includes:
e1) making the data files related to the current broadcast content and the broadcast contents already broadcasted have the same title as the broadcast content; and
e2) segmenting the data files into segments, and generating data broadcast stream by dynamically allocating the segments in such a method that more segments are allocated, as the segments are related to a broadcast content having a broadcasting time closer to the current time point;

[18] A digital radio broadcast receiving method for downloading data files related to broadcast contents that are applied to a digital radio broadcast, comprising the steps of:
a) inverse-multiplexing a digital radio broadcast signal into broadcast stream, broadcast program data, and data broadcast stream;
b) decoding the inverse-multiplexed broadcast stream;
c) receiving selection data for a data file a user wants to download from the user;
d) generating a list of data files that is extracted from the inverse-multiplexed broadcast program data; and
e) restoring the data file by extracting only the segments related to the data files having the same title as the broadcast content selected by the user from the data broadcast stream according to the selection data from the user, storing the restored data file.

[19] The digital radio broadcast receiving method as recited in claim 18, wherein the step e) includes the steps of:

e1) recognizing title data and identifier (ID) data related to the data files by analyzing the data broadcast stream;

e2) if selection data on which data file needs to be downloaded are transmitted from the user, searching data files having the same title as the data file selected by the user; and

e3) restoring the data file by extracting segments related to the data files selected by the user by using the ID data for the searched data file and storing the restored data file.

[20] The digital radio broadcast receiving method as recited in claim 19, further comprising the steps of:

e4) playing the data file stored in the step e3) upon the user's request; and

e5) transmitting the data file stored in the step e3) to the outside upon the user's request.

FIG. 1
(PRIOR ART)

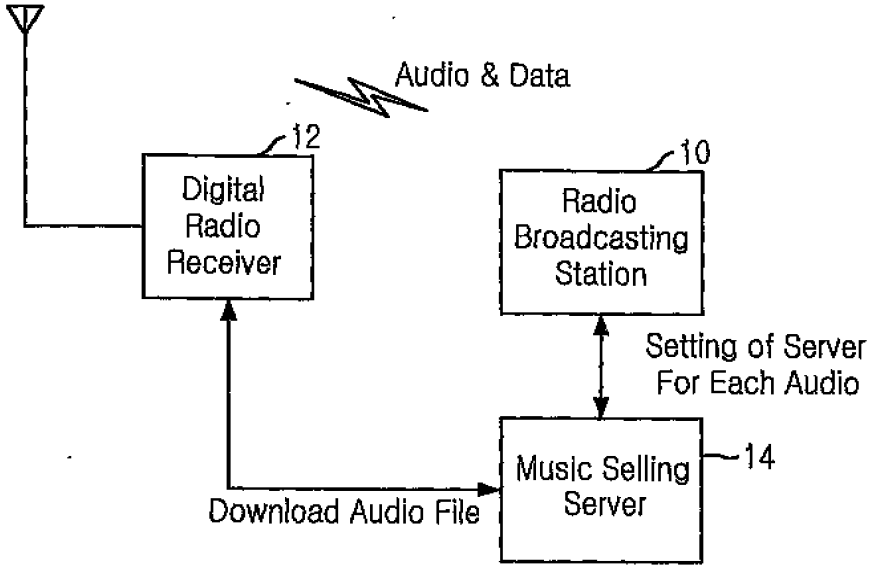


FIG. 2

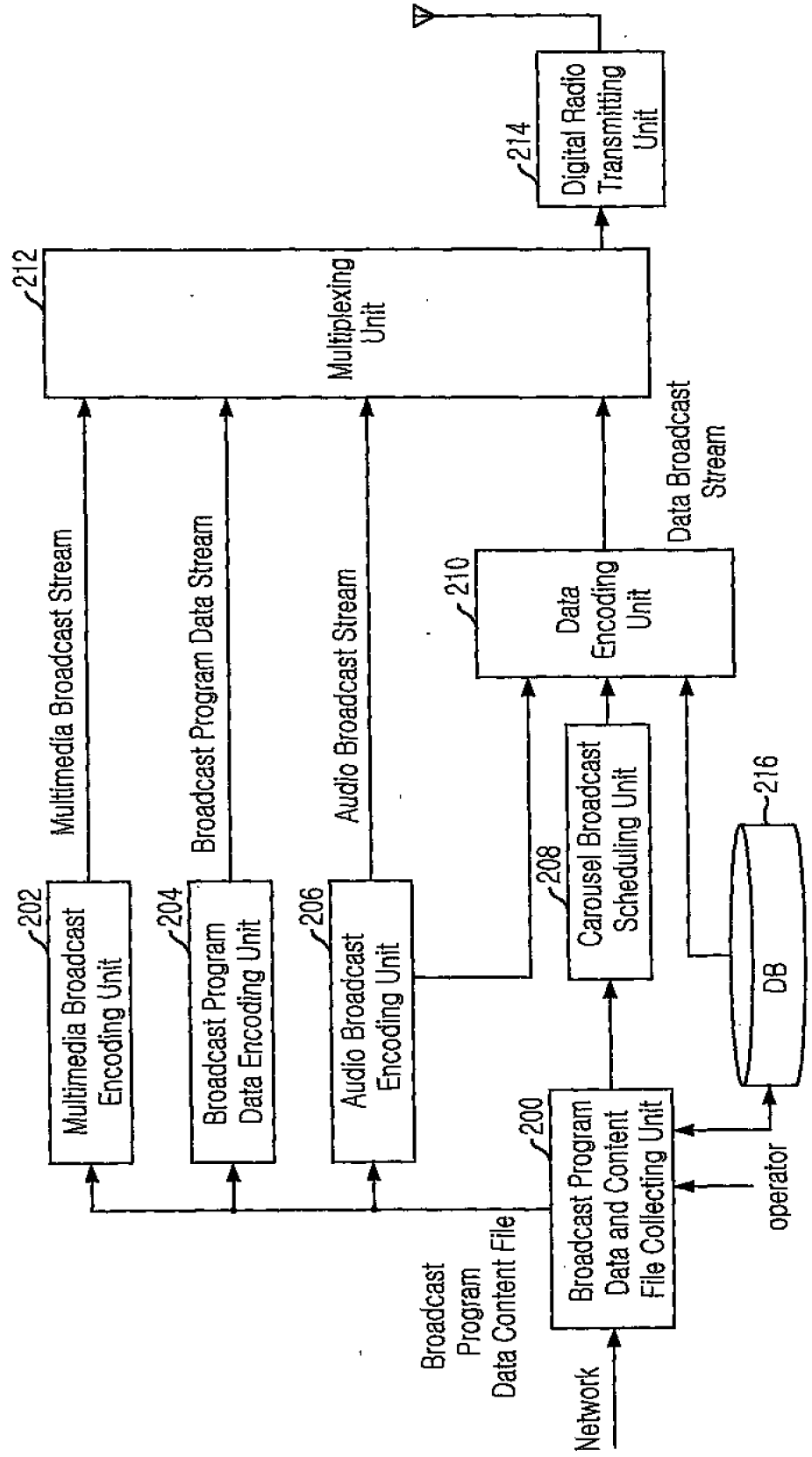

Network
Broadcast Program Data Content File
Broadcast Program Data and Content File Collecting Unit
200
operator
DB
216
Carousel Broadcast Scheduling Unit
208
Data Encoding Unit
210
Data Broadcast Stream
Audio Broadcast Encoding Unit
206
Broadcast Program Data Encoding Unit
204
Multimedia Broadcast Encoding Unit
202
Audio Broadcast Stream
Broadcast Program Data Stream
Multimedia Broadcast Stream
Multiplexing Unit
212
Digital Radio Transmitting Unit
214

FIG. 3

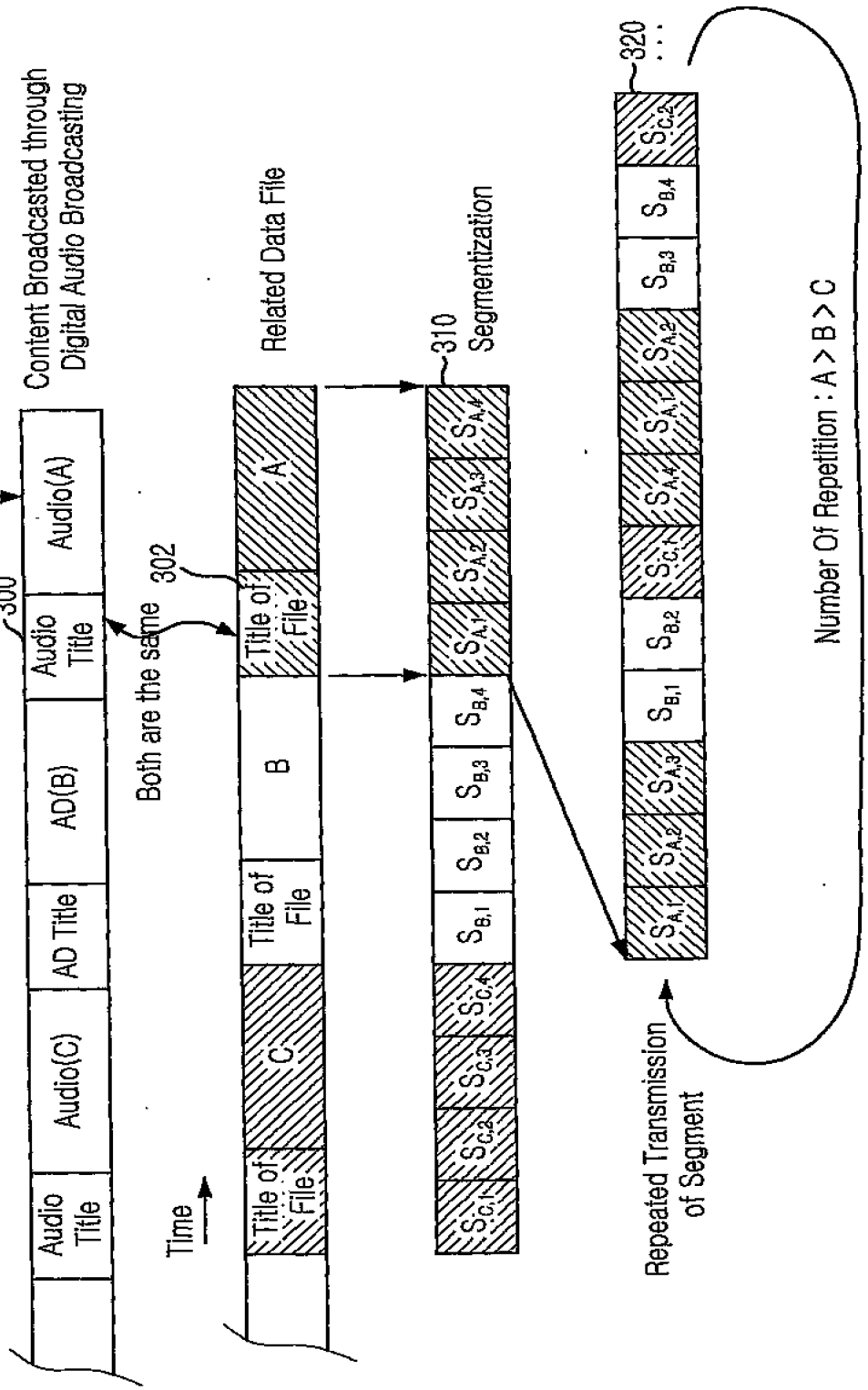

Content Broadcasted through Digital Audio Broadcasting
Related Data File
310
Segmentization
320
Current Time
300
Audio Title
Audio(A)
AD(B)
AD Title
Audio(C)
Audio Title
302
Both are the same
Title of File
A
B
C
Title of File
Title of File
Time
Repeated Transmission of Segment
Number Of Repetition : A > B > C

FIG. 4

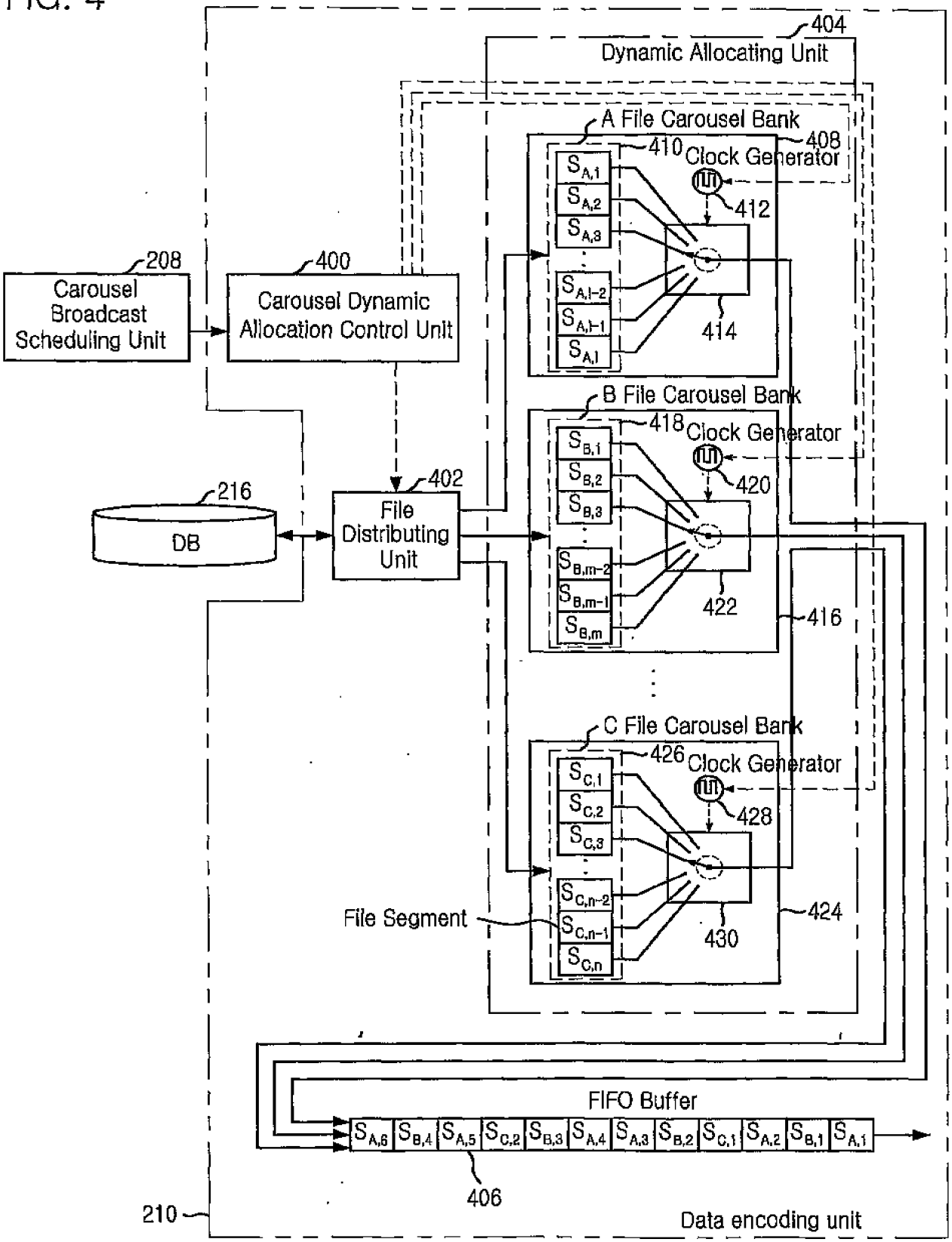

404
Dynamic Allocating Unit
A File Carousel Bank
408
410
Clock Generator
412
414
208
Carousel Broadcast Scheduling Unit
400
Carousel Dynamic Allocation Control Unit
B File Carousel Bank
418
Clock Generator
420
422
216
DB
402
File Distributing Unit
416
C File Carousel Bank
426
Clock Generator
428
430
424
File Segment
FIFO Buffer
406
210
Data encoding unit

FIG. 5

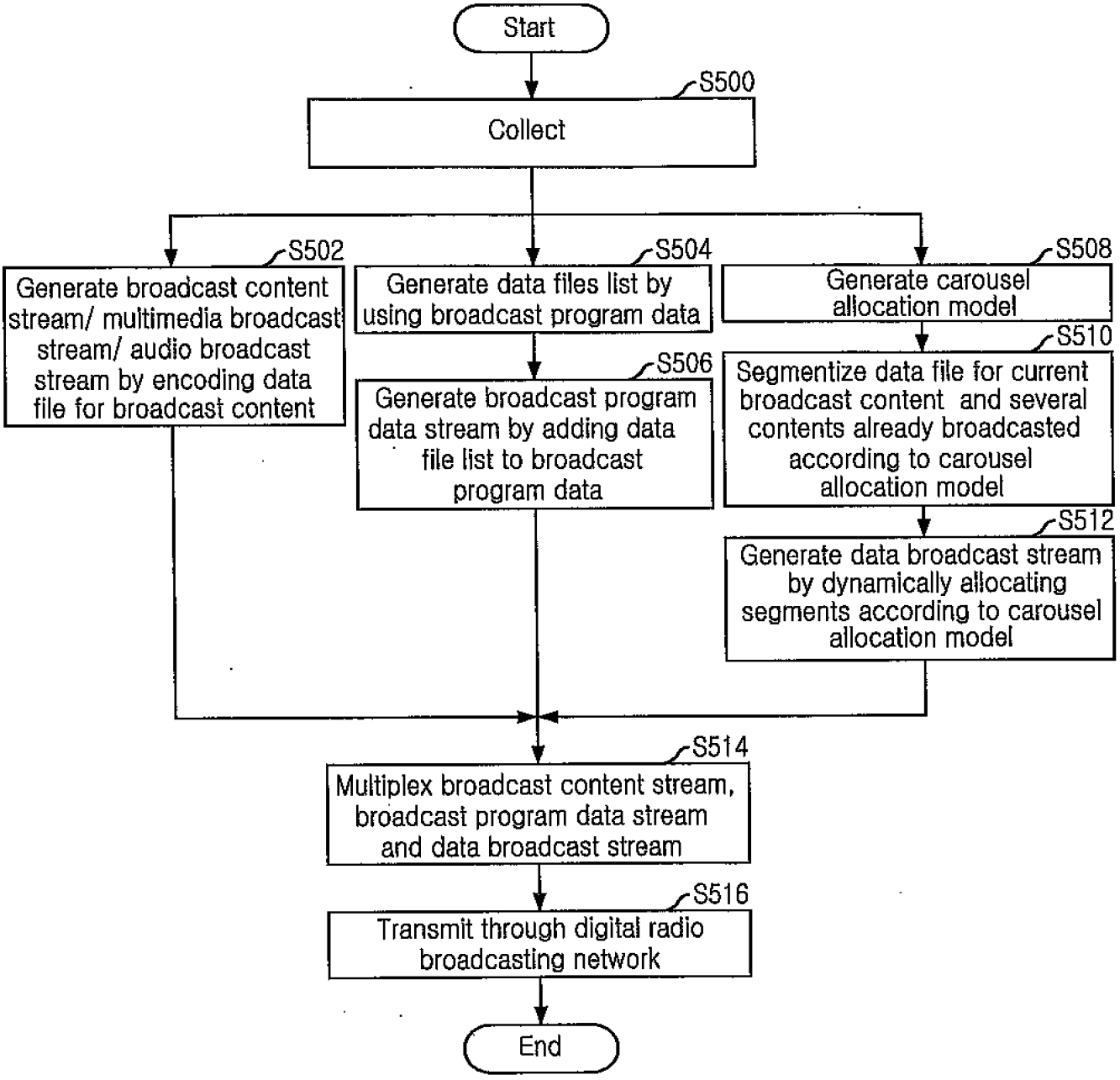

Start
S500
Collect
S502
Generate broadcast content stream/ multimedia broadcast stream/ audio broadcast stream by encoding data file for broadcast content
S504
Generate data files list by using broadcast program data
S506
Generate broadcast program data stream by adding data file list to broadcast program data
S508
Generate carousel allocation model
S510
Segmentize data file for current broadcast content and several contents already broadcasted according to carousel allocation model
S512
Generate data broadcast stream by dynamically allocating segments according to carousel allocation model
S514
Multiplex broadcast content stream, broadcast program data stream and data broadcast stream
S516
Transmit through digital radio broadcasting network
End

FIG. 6

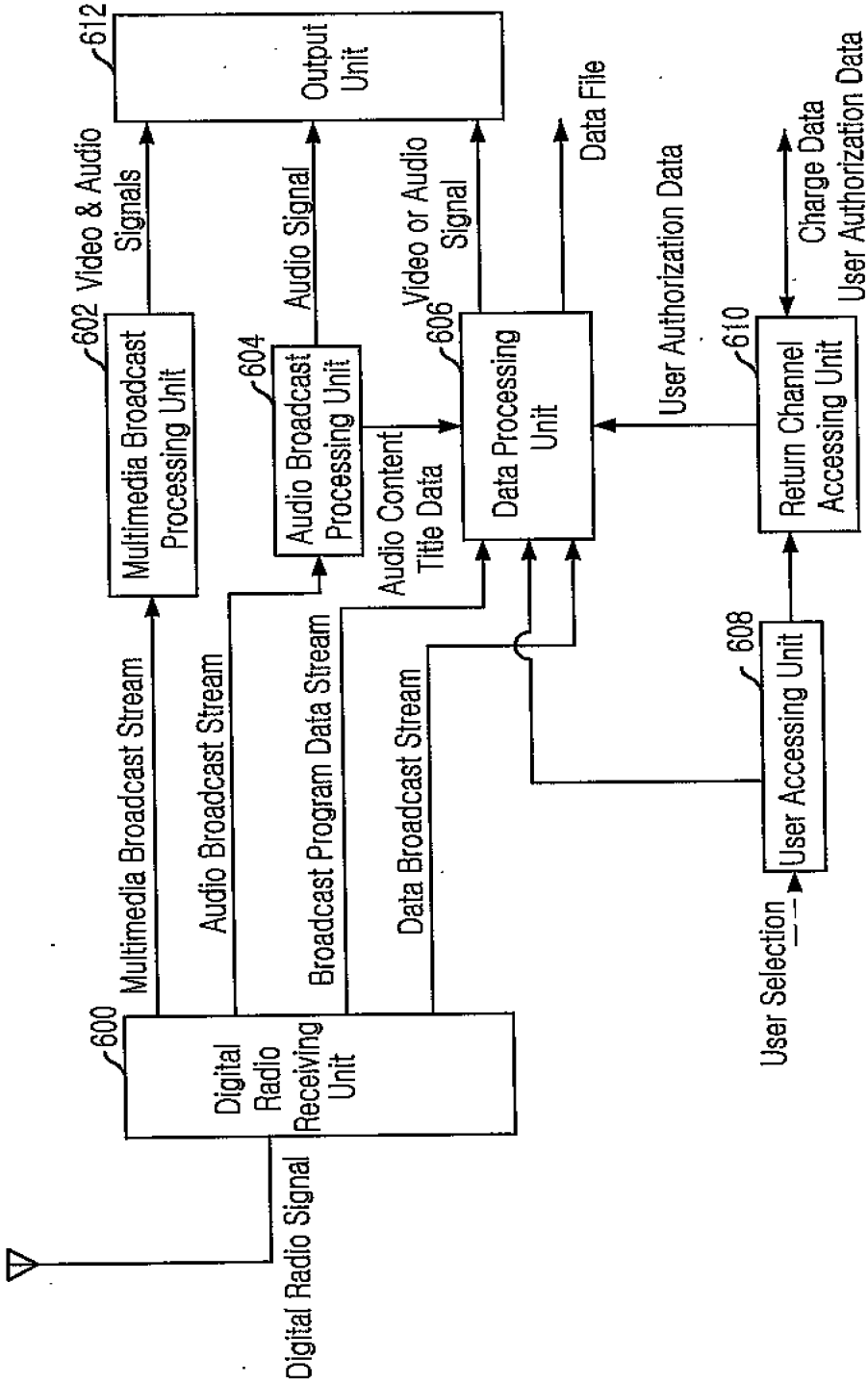

612
Output Unit
602
Multimedia Broadcast Processing Unit
604
Audio Broadcast Processing Unit
606
Data Processing Unit
610
Return Channel Accessing Unit
608
User Accessing Unit
600
Digital Radio Receiving Unit
Video & Audio Signals
Audio Signal
Video or Audio Signal
Data File
User Authorization Data
Charge Data
User Authorization Data
Multimedia Broadcast Stream
Audio Broadcast Stream
Broadcast Program Data Stream
Data Broadcast Stream
Audio Content Title Data
User Selection
Digital Radio Signal

FIG. 7

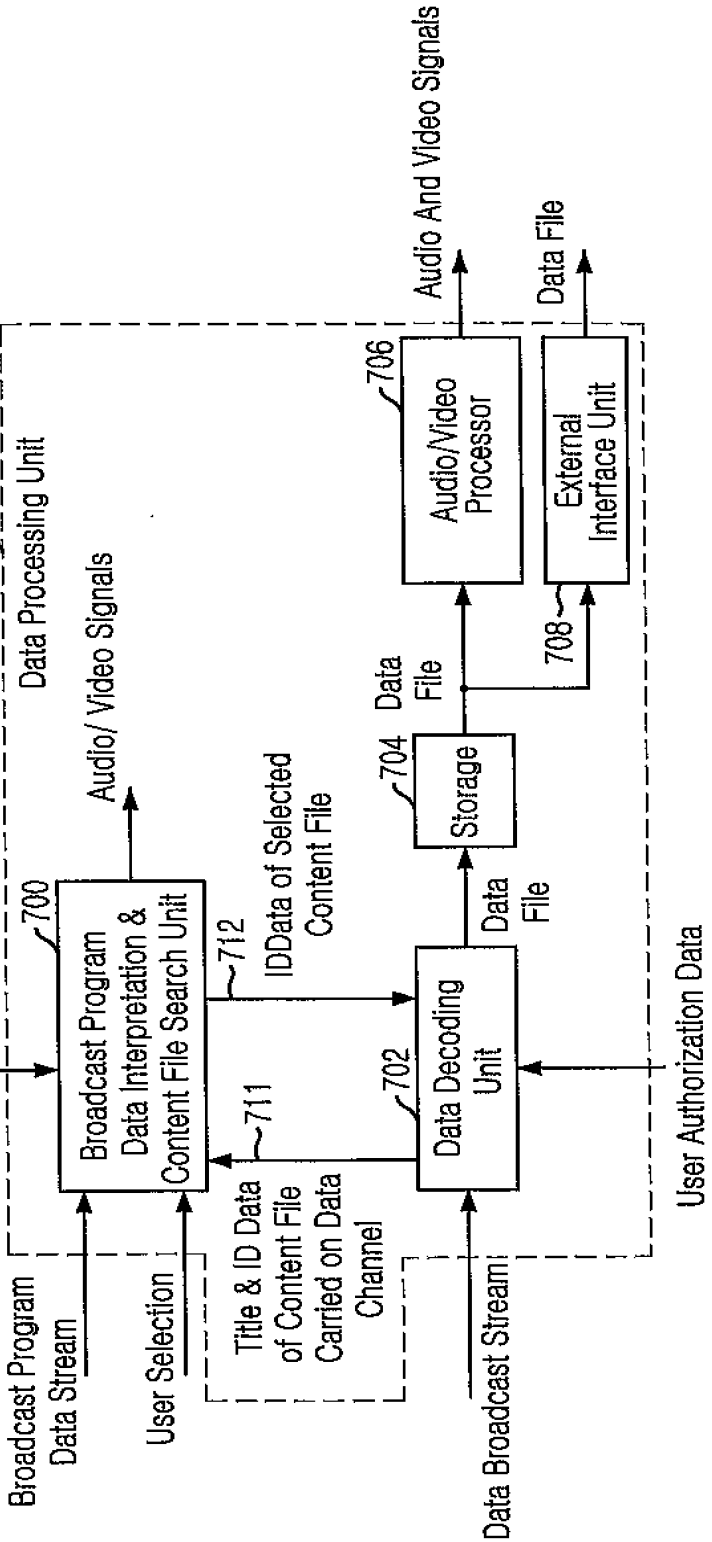
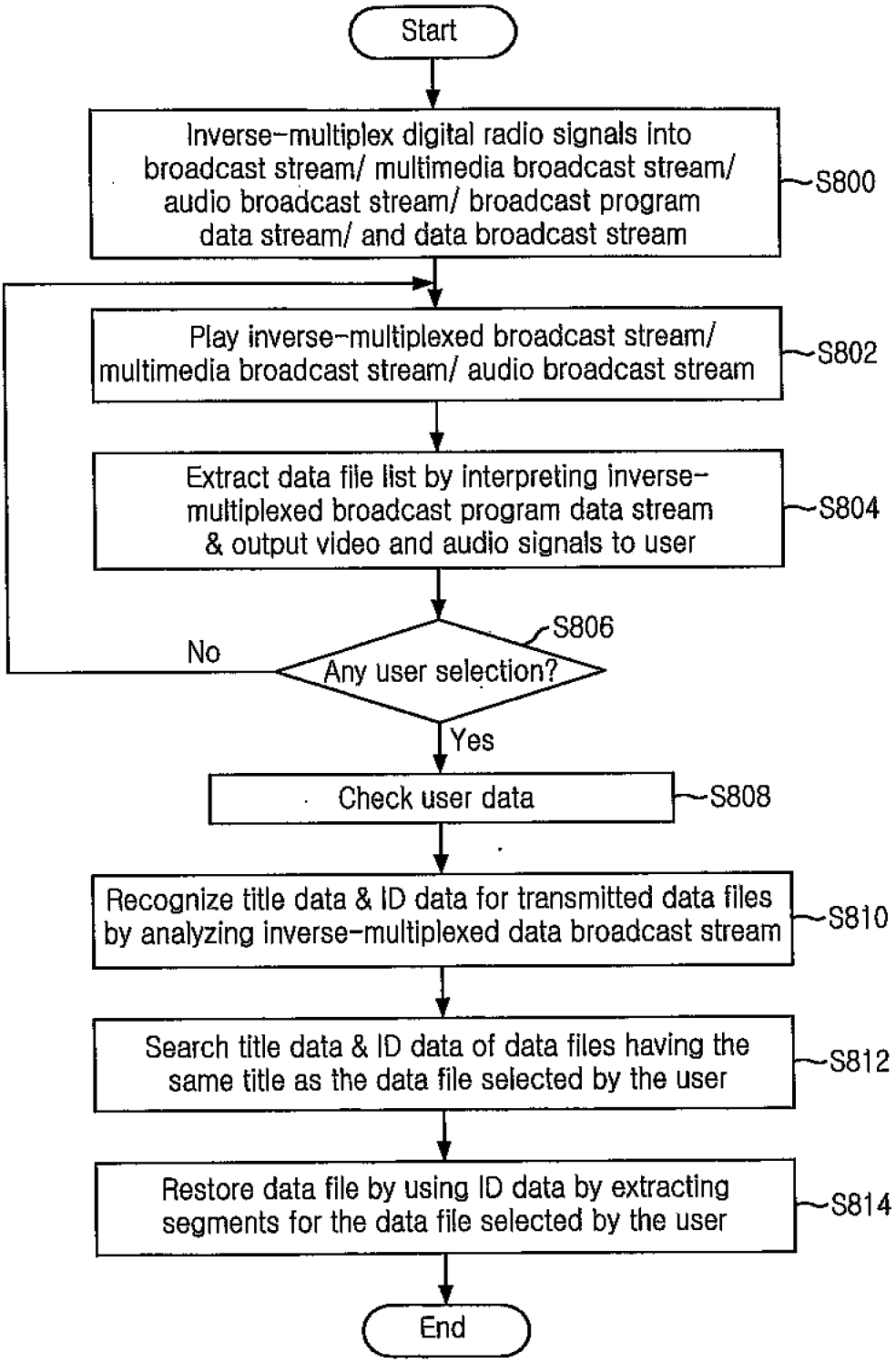

Audio Content Title Data
Broadcast Program Data Stream
User Selection
Title & ID Data of Content File Carried on Data Channel
Data Broadcast Stream
User Authorization Data
606
Data Processing Unit
700
Broadcast Program Data Interpretation & Content File Search Unit
Audio/ Video Signals
712
IDData of Selected Content File
711
702
Data Decoding Unit
Data File
704
Storage
Data File
706
Audio/Video Processor
Audio And Video Signals
708
External Interface Unit
Data File

FIG. 8


Start
Inverse-multiplex digital radio signals into broadcast stream/ multimedia broadcast stream/ audio broadcast stream/ broadcast program data stream/ and data broadcast stream
S800
Play inverse-multiplexed broadcast stream/ multimedia broadcast stream/ audio broadcast stream
S802
Extract data file list by interpreting inverse-multiplexed broadcast program data stream & output video and audio signals to user
S804
S806
Any user selection?
No
Yes
Check user data
S808
Recognize title data & ID data for transmitted data files by analyzing inverse-multiplexed data broadcast stream
S810
Search title data & ID data of data files having the same title as the data file selected by the user
S812
Restore data file by using ID data by extracting segments for the data file selected by the user
S814
End

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2004/001342

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04L 12/66

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC7: H04L, H04M, G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Patents and Applications for Inventions since 1975
Korean Utility Models and Applications for Utility Models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
IEEEL(IEEE/IEE Electronic Library)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/0010789 A1(Frank H. Lord) 24. January 2002 abstract, claims, figures	1-7
A	JP2002-300063 (Minolta Co. Ltd.) 11. October 2002; abstract claims, description, figures	8-20
A	JP2002-300055 (Minolta Co. Ltd.) 11. October 2002; abstract claims, description, figures	8-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 AUGUST 2004 (30.08.2004)	30 AUGUST 2004 (30.08.2004)

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer
LEE, Saang Woong
Telephone No. 82-42-481-5687

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR2004/001342

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002/0010789 A1	24. 01. 2002	None	
JP2002-300063	11. 10. 2002	None	
JP2002-300055	11. 10. 2002	None	